

MEMO

To: United States Environmental Protection Agency

From: SBA Shipyard Superfund PRP Group

CC: Louisiana Department of Environmental Quality

Date: October 23, 2019

Re: Baseline Human Health Risk Assessment Work Plan and Conceptual Exposure Model

1 Introduction

EHS Support, LLC (“EHS Support”) is providing this baseline human health risk assessment (BHHRA) work plan (“BHHRA Work Plan”) and the BHHRA’s updated Conceptual Exposure Model (CEM) for the SBA Shipyard Superfund Site located in Jennings, Jefferson Davis Parish, Louisiana (**Figure 1**). The BHHRA Work Plan presents the following:

- Technical framework for the conduct of the risk assessment
- Methodologies to be employed to conduct the risk assessment for the Site
- Updated CEM presenting the potentially complete exposure pathways

The BHHRA will provide the basis for determining whether remedial action is necessary at the Site as well as the extent of remedial action required to address potential unacceptable risk to human receptors. This BHHRA will focus on exposures using the data collected during the Remedial Investigation/Feasibility Study (RI/FS) investigation activities for soil, groundwater, surface water, and sediment.

The BHHRA Work Plan is consistent with the methodology outlined in the RI/FS Work Plan (EHS Support, 2018). The primary regulatory guidance for conducting the BHHRA is presented in a series of United States Environmental Protection Agency (USEPA) publications titled *Risk Assessment Guidance for Superfund (RAGS)*, Volume I: Parts A through F (USEPA 1989, 1991a, 1991b; 2001, 2004, and 2009); commonly referred to as “RAGS Part A thru Part F”. The USEPA has issued additional risk assessment guidance beyond that which is presented in RAGS. The purpose of this additional guidance is to provide risk assessment guidance that, when used in conjunction with RAGS, reflects current scientific knowledge. In addition, the Louisiana Department of Environmental Quality (LDEQ) Risk Evaluation/Corrective Action Program (RECAP) Guidance (LDEQ, 2003) will be used in conjunction with the USEPA guidance, as applicable. The format for the BHHRA will follow the USEPA’s Risk Assessment Guidance for Superfund (RAGS) Part D (USEPA, 2001).



2 Technical Approach

The BHHRA will be conducted to evaluate the potential human health effects posed by exposure to affected environmental media at the Site in the absence of any remedial action. The BHHRA will provide the basis for determining whether remedial action is necessary in the various exposure areas identified at the Site, as well as the extent of remedial action required to address potential unacceptable risk to human receptors.

The BHHRA Work Plan includes the methodologies for implementing the components of the BHHRA including:

- Hazard identification – data usability, statistical evaluation of data, and selection of constituents of potential concern (COPCs).
- Exposure assessment – calculations of the exposure point concentration (EPC) of COPCs in each medium, identification of the exposure assumptions, and presentation of the equations for calculation of the daily intake dose based on magnitude, frequency, and duration of exposures over a specified exposure period of time.
- Toxicity assessment – the relationship between the potential extent of exposure and toxicological effects of the exposure for each COPC-specific toxicity criteria are presented, including cancer slope factors (CSFs) or unit risk factors (URFs) for carcinogens, and reference doses (RfDs) or reference concentrations (RfCs) for non-carcinogens.
- Risk characterization – integration of the toxicity and exposure assessments to derive quantitative estimates of potential human health risks for carcinogens and non-carcinogens, and presentation of the uncertainties and limitations inherent in the estimation of the potential risks.

As noted in the introduction, the proposed format for the BHHRA will follow USEPA's RAGS Part D (USEPA, 2001). The regulatory guidance for conducting the BHHRA includes RAGS Parts A through F (USEPA 1989, 1991a, 1991b, 2001, 2004, and 2009), and the guidance and procedures that USEPA has issued in addition to the RAGS guidance. The RAGS Part D (USEPA, 2001) Standardized Tables will be completed for all BHHRA components. In addition, the LDEQ RECAP Guidance (LDEQ, 2003) will be used in conjunction with the USEPA guidance, as applicable. **Sections 2.1** through **2.4** provide the technical approach for each component of the BHHRA. The preliminary human health CEM was presented in the RI/FS Work Plan (EHS Support, 2018). **Section 3** presents the updated CEM and summarizes the completed RAGS Part D tables detailing the potential complete exposure pathways by exposure areas.

2.1 Hazard Identification

The purpose of the hazard identification process is to summarize the environmental media data and to screen the data to determine the COPCs that will be evaluated further in the risk assessment process.

2.1.1 Data Used in the Risk Assessment

Data collected during the RI/FS investigation activities for soil, groundwater, surface water, and sediment will be assessed in the BHHRA. The environmental media data used in the BHHRA will be managed electronically and compiled by constituent, medium, exposure area, sample location, and



sample depth, if applicable. All descriptive and statistical analyses of the data will be performed using ProUCL Version 5.1 software that was developed for USEPA (USEPA, 2016). The database will include all RI/FS investigation activities data through the August 2019 sampling event. If additional on-site data is required to satisfy RI/FS objectives, it will be incorporated into the database, as applicable to risk characterization.

2.1.2 Data Usability and Data Decisions

To determine the data quality and usability in the BHHRA, data verification and validation were performed to confirm that the project data met the data quality objectives (DQOs) outlined in the RI/FS Work Plan and Quality Assurance Project Plan (QAPP) (EHS Support, 2018). All chemical laboratory data collected during RI/FS activities went through a data usability assessment to establish whether the reported results are of acceptable quality for use in the RI/FS and to identify any reported results that are invalid. Following the data usability assessment, 10 percent of laboratory sample delivery group (SDG) reports went through a Tier II data validation review. Data validation was performed to determine whether the laboratory was operating within applicable limits and which, if any, environmental sample results were related to quality control (QC) results that were outside control limits. If any data were rejected as a result of data validation, the data will not be included in the dataset for the BHHRA.

2.1.3 Selection of COPCs

As presented in the RI/FS Work Plan, the purpose of this section is to select COPCs in order to focus the risk assessment on potentially important site-related chemicals for quantitative evaluation. The identification of COPCs is based on comparing the maximum measured constituent concentration with toxicity-based screening concentrations. In addition, the frequency that a COPC is detected will also be considered in selecting COPCs. In general, chemicals that are detected very infrequently at a site are not likely to contribute significantly to overall risk (USEPA, 1989).

Consistent with the recommendations of the USEPA Regional Screening Level (RSL) guidance (USEPA, 2019a), a target risk of 10^{-6} for carcinogens and target hazard quotient (THQ) equal to 0.1 will be used to screen the COPCs. The THQ of 0.1 will be used to address multiple chemicals that may have non-carcinogenic effects based on the same toxic endpoint and the same mode-of-action (MOA). This is also consistent with the LDEQ RECAP Screening Standards that are based on a THQ equal to 0.1. The approved hierarchy of sources for human health screening criteria for the selection of COPCs (EHS Support, 2018) are summarized below for soil, groundwater, surface water, and sediments:

- Soil:
 - USEPA RSLs for Industrial Sites, THQ = 0.1
 - LDEQ RECAP Screening Standards for Industrial Land Use Scenarios
- Groundwater:
 - USEPA RSLs for Tap water, THQ = 0.1
 - LDEQ RECAP Screening Standards for Groundwater Classifications 1, 2 and 3
- Surface Water:
 - LDEQ – Human Health Protection Drinking Water Supply (Louisiana Administrative Code [LAC] Title 33 Part IX. Subpart 1; February 2019)
 - USEPA National Recommended Water Quality Criteria (NRWQC) – Human Health for the Consumption of Water and Organisms



- Sediments
 - USEPA RSLs for Industrial Sites, THQ = 0.1
 - LDEQ RECAP Screening Standards for Non-Industrial Land Use

To evaluate the potential for vapor intrusion of COPCs to indoor air, groundwater data will also be compared to the most recent version of the USEPA Vapor Intrusion Screening Levels (USEPA, 2019b), with a target risk of 10^{-6} and a THQ = 0.1.

If a COPC does not have an applicable human health screening criteria, the screening criteria for a surrogate chemical may be used, where available and applicable. Surrogates will be selected based on structural similarity and molecular weight, as well as toxicologically similar effects. If the risk-based screening indicates that potential risks are insignificant, then further action will not be necessary. An insignificant risk resulting from long-term exposure is one in which the concentration of the COPCs is less than the risk-based screening values representing a theoretical excess risk of getting cancer of less than one-in-a million (10^{-6}) or a hazard quotient of less than one (unity) for non-carcinogenic effects.

2.2 Exposure Assessment

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each identified COPC based on the hazard identification. The updated human health CEM (**Section 3**) presents the potential receptors by exposure area and media of concern. In the case that the estimated exposures result in an unacceptable hazard or risk, a central tendency exposure (CTE) may additionally be calculated. The CTE is designed to reflect a more typical, though still conservative, exposure.

The EPC for each exposure area and environmental media will be either the maximum detected concentration or the 95 percent upper confidence limit of the mean (UCL). If a sufficient number of data points (i.e., greater than 10), either in the sample set or distinct observations, are not available for the exposure scenario, the maximum detected concentration will be selected as the EPC. The 95 percent UCL will be calculated using ProUCL and will be dependent on the distribution of the data. If the 95 percent UCL exceeds the maximum detected concentration of a COPC, then the corresponding maximum concentration will be used as the EPC. Recommendations provided by the ProUCL software for the evaluation of sample results qualified as below the detection level (non-detect) will be followed.

The exposure assumptions to be used in the BHHRA are based on site-specific conditions or default exposure assumptions presented in the following guidance documents:

- USEPA RSLs Table (USEPA, 2019a)
- Exposure Factors Handbook (USEPA, 2011)
- Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part E - Supplemental Guidance for Dermal Risk Assessment (USEPA, 2004)
- Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part F - Supplemental Guidance for Inhalation Risk Assessment (USEPA, 2009)
- RECAP guidance (LDEQ, 2003)

Site-specific exposure assumptions will be developed based on communication with local agencies (e.g., fish and wildlife personnel) and recreational organizations, when available.



Intake dose equations for ingestion and dermal contact and exposure concentration (EC) equations for inhalation to estimate non-carcinogenic health effects (average daily intake [ADI]) and carcinogenic effects (lifetime average daily intake [LADI]) will be based on the USEPA RSL exposure equations. There is evidence that certain chemicals exhibit a mutagenic MOA that may cause irreversible changes to DNA and would have greater effect in early-life (e.g., a child) than later-life (e.g., adult) exposure (USEPA, 2005a; USEPA, 2005b). Therefore, it is recommended to use age-specific values for assessing children exposures because children are expected to have exposures that differ from adults based on size, physiology, and behavior. Where applicable (i.e., selected COPCs that are mutagenic), the equations from the USEPA (2019a) RSL guidance document were used to address COPCs with a mutagenic MOA. These equations are presented with the other exposure equations.

Modeling of environmental concentrations or exposures (e.g., bioaccumulation in aquatic biota) will be conducted using exposure assessment tools presented on the USEPA EXPOsure toolBOX ("EPA ExpoBox") website, or other resources (e.g., Virginia Department of Environmental Quality's construction trench vapor intrusion model [VDEQ, 2018]) as well as the RECAP guidance (LDEQ, 2003).

2.3 Toxicity Assessment

The purpose of the toxicity assessment is to determine the relationship between the dose of a COPC taken into the body, and the probability that an adverse effect will result from that dose. The approved primary sources of toxicity values in order of preference are as follows (EHS Support, 2018):

- USEPA Integrated Risk Information System
- Provisional peer-reviewed reference toxicity values (PPRTV)
- Agency for Toxic Substances and Disease Registry's Minimal Risk Levels
- California Environmental Protection Agency Office of Environmental Health Hazard Assessment risk assessment health values
- Other sources (screening values from "PPRTV Appendix" sources and other specific individual toxicity values and USEPA Superfund program's Health Effects Assessment Summary Table)

Quantitative estimates of the potency of COPCs include two sets of toxicity values, one for carcinogenic effects and one for non-carcinogenic effects. For carcinogenic effects, the USEPA assumes a non-threshold toxicological mechanism that assumes there is no level of exposure that does not pose a probability that an adverse effect will result from that dose (USEPA, 2005a). Toxicity criteria for non-carcinogens assume that there is a threshold effects level below which adverse health effects are not expected to occur. Non-carcinogenic dose-response values include the source and primary target organ for a COPC, which is the organ that is affected at the lowest dose and experiences critical organ effects.

2.4 Risk Characterization

The purpose of the risk characterization is to provide a conservative estimate of the potential risk resulting from exposure to COPCs identified in the environmental media of the Site. Included in this section is a quantitative estimate of potential carcinogenic and non-carcinogenic risks for each complete exposure pathway for each receptor.

Carcinogenic risks will be estimated in the BHHRA by summing the excess lifetime cancer risk over all the exposure pathways for a receptor group. For non-carcinogens, the individual hazard quotients (HQs) will



be summed for an overall hazard index (HI). If the HI is less than 1.0, then no adverse health effects are likely associated with exposures at the Site.

Cancer risks will be expressed as the upper-bound, increased likelihood of an individual developing cancer because of exposure to a particular COPC. The following equation is used to estimate the excess cancer risk:

$$\text{Cancer Risk} = LADI \times CSF \text{ or } EC \times IUR$$

Where:

- LADI = Lifetime average daily intake (milligrams per kilogram per day; mg/kg-day)
- CSF = Cancer Slope Factor (mg/kg-day)⁻¹
- EC = Exposure concentration (micrograms per cubic meter; µg/m³)
- IUR = Inhalation Unit Risk (µg/m³)⁻¹

Cancer risk estimates for individual chemicals are summed by media and exposure pathway to generate an estimate of cumulative risk. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) states that, for carcinogens, acceptable exposure represents an excess upper-bound lifetime cancer risk to an individual between 10⁻⁶ and 10⁻⁴. Cancer risks less than 1 × 10⁻⁶ are generally considered *de minimis*.

Noncancer effects from exposure to a COPC are expressed as an HQ. An HQ is the ratio of the estimated intake (ADI) or EC of a COPC to the corresponding COPC-specific RfD or RfC. The following equation is used to estimate the noncancer risk:

$$\text{Hazard Quotient} = ADI/RfD \text{ or } (EC \times CF)/RfC$$

Where:

- ADI = Average daily dose (mg/kg-day)
- RfD = Reference dose (mg/kg-day)
- EC = Exposure concentration (µg/m³)
- CF = Correction factor, 0.001 milligrams per microgram (mg/µg)
- RfC = Reference concentration (milligrams per cubic meter; mg/m³)

The COPC- and pathway-specific HQs are combined as an HI, which is then compared to a typically accepted benchmark level of 1. If the HI exceeds 1, then combined site-specific exposures exceed the RfDs and/or RfCs, and there is a potential for noncancer adverse effects to result from exposure to Site COPCs under the evaluated receptor scenario(s). However, if the total HI is greater than 1, separate endpoint-specific HIs will be calculated based on target organs (e.g., HQs for neurotoxins are summed separately from HQs for renal toxins). Only if a target-organ-specific HI is greater than 1 is there a reason for concern about potential health effects for that target organ and receptor.

2.4.1 Uncertainty Analysis

The procedures and inputs used to assess potential human health risks in this and similar BHHRAs are subject to a wide variety of uncertainties. In general, there are five main sources of uncertainty and variability in risk assessments of well-characterized sites:



- Environmental chemistry sampling and analysis
- Environmental parameter measurements
- Fate and transport modeling
- Toxicological data and dose-response extrapolations
- Updated risk assessment methodologies, exposure assumptions, and toxicological data

These sources of uncertainty will be discussed qualitatively in the BHHRA.

3 Human Health Conceptual Exposure Model

The Site consists of 98 acres of land in a rural-industrial area and is comprised of two separately-owned parcels, referred to herein as the Northern Property and the Southern Property (**Figure 1**). As part of the RI/FS Work Plan, Investigation Areas of Interest (IAIs) and Investigation Areas of Concern (IACs) were defined to direct site characterization activities (**Figure 2**). The IAIs and IACs include:

- IAC-1 – Partially-Buried Barge
- IAC-2 – Boiler Barge and aboveground storage tank (AST) Area (USEPA Source Area 2)
- IAC-3 – Barge Cleaning Surface Impoundments Area (USEPA Source Areas 3, 4, 5, 6, and 7)
- IAC-4 – Historical Waste Storage Area
- IAC-5 – Barge Cleaning Area Drainage Ditch
- IAC-6 – Barge Slip (USEPA Source Area 8)
- IAC-7 – Dry Dock (USEPA Source Area 9)
- IAI-1 – Southern Wetland Area
- IAI-2 and IAI-3 – Additional Land Areas on Southern Property
- IAI-4 and IAI-5 – Land Area and Barge Maintenance Area on Northern Property
- IAI-6 and IAI-7 – Vessel Slips on Northern Property

The Mermentau River was also identified as an area of further investigation for the site characterization due to the potential for historical discharges to the river. Additionally, subsequent to the submission of the RI/FS Work Plan, the IAI-8 area (off-site wetland area) was identified as an area of interest because of drainage of surface water from the Northern Property to this wetland feature. Discharge from the wetland returns to the southern corner of the Northern Property via a ditch and crosses into the Southern Property where it eventually connects to IAC-5.

The Site is currently inactive and fenced with locked gates to inhibit access. Historical operations on the Northern Property reportedly included barge and vessel construction, repair, and cleaning operations. The Southern Property was historically used for barge cleaning operations. During historical operations, asphaltic-like residual materials were placed across the Site, primarily on roadways and other heavily used areas. Sheep and cattle were observed grazing on the property in 2012; however, access to the Site by livestock and farmers is currently restricted by farmers. The Mermentau River borders the Site to the south and east, to the west of the Site are privately-owned agricultural fields, and to the north of the Site is a cluster of residential homes situated on the bank of the Mermentau River. During previous investigations, public boaters and fishermen were observed along the river, the inlet to the Dry Dock, and within the Barge Slip catching catfish for consumption.



The Site is generally flat topographically with a gentle slope towards the Slips and Mermentau River. The Site is underlain by clays and silty clays down to an explored depth of 76 feet below ground surface (ft bgs) and shallow groundwater has been encountered between 1.25 and 16 ft bgs during drilling activities. The Chicot Aquifer System is the primary source of water withdrawals in the vicinity of the Site and is located approximately 100 ft bgs under confined conditions. Domestic wells and Mermentau River supply wells are screened within this aquifer. No domestic wells identified within a ¼-mile radius of the Site were active, and potable water is provided from the Jefferson Davis Parish municipal system (EHS Support, 2018). It is not known if there is an ordinance restricting the installation of domestic water supply wells within the Prairie Complex Confining Unit. Two large wetlands areas, totaling approximately 28.7 acres, are present in the southern portion of the site (IAI-1 and portion of IAC-4). Additionally, the drainage ditch of IAC-5 exhibits properties of a wetland.

Based on the potential migration pathways and nature of site-related COPCs discussed in the RI/FS Work Plan, the following potential exposure pathways were considered in the preliminary human health CEM (EHS Support, 2018):

- Direct contact (incidental ingestion and dermal contact) with COPCs in on-site soil, sediments, and surface water
- Inhalation of COPCs in on-site dust/particulate matter
- Inhalation of volatile COPCs in indoor and outdoor air from soil and shallow groundwater
- Direct contact with COPCs in shallow groundwater as a result of construction or trenching activities
- Direct contact with COPCs in off-site sediments and surface water

Potential receptors are defined as human populations or individuals and environmental systems that are susceptible to COPC exposure from the Site. Both current and future land and water-use conditions are considered in identifying potential receptors and exposure scenarios. The preliminary CEM in the RI/FS Work Plan (EHS Support, 2018) identified the following potential on-site receptors for the current and future land use scenarios based on the understanding of the nature and extent of impacts and potential movement and transformation of chemicals from their source through the environment at the Site:

- Current land use
 - On-site trespassers (adolescent child)
 - On-site recreational receptors (e.g., fishermen - adult and child)
- Future land use
 - On-site workers
 - On-site trespassers (adolescent child)
 - On-site construction workers

At this time, there is no plan for residential development of the property in the future. Therefore, on-site residential receptors will not be considered in the future scenario. The preliminary CEM identified the current and future off-site farmer as a potential receptor to site-related COPCs via direct contact with COPCs in surface soil, inhalation of dust, and volatiles from surface soils. Additionally, the preliminary CEM identified the potentially complete pathway to site-related COPCs through direct contact with surface soil, inhalation of outdoor air containing volatile organic compounds (VOCs) and sufficiently volatile semi-volatile organic compounds (SVOCs) (e.g., naphthalene) from subsurface soil, shallow groundwater, and non-aqueous phase liquid (NAPL). However, the property is now secured with



a fence along the boundary between the adjacent agricultural area and the Site. Therefore, the off-site farmer and grazing livestock are no longer considered potential on-site receptors.

The potential receptors will be re-evaluated after completion of the RI/FS activities to determine if the current understanding remains protective of all potential receptors.

3.1 Exposure Areas and Exposure Pathways

To characterize potential human health risk from potential exposure to COPCs at the Site, preliminary exposure areas were developed as part of the RI/FS Work Plan (EHS Support, 2018) and were based on the previous operations and historical activities, potential source areas, potential future use and development, and physical features (e.g., wetlands or water body). The exposure areas identified in the RI/FS Work Plan were soils and residual materials, site-wide groundwater from the Prairie Complex Confining Unit, wetlands, and surface water (EHS Support, 2018).

The soil and residual materials were further divided into the operational, non-operational, and off-site areas. Operational areas are those where industrial activities and associated waste management and disposal activities occurred. Non-operational areas are those areas where no documented industrial activities or waste management and disposal have occurred. In addition to the two on-site exposure areas for soil, off-site soils were considered a separate exposure area.

For the purposes of the BHHRA, the preliminary exposure areas and CEM were further revised to evaluate exposures on the Northern Property versus the Southern Property. Groundwater will be evaluated as a site-wide exposure area. The following sections discuss the exposure areas that will be assessed in the BHHRA and the potentially complete exposure pathways and receptors that will be assessed for each exposure area. Incomplete exposure pathways that will not be further assessed in the BHHRA at this time are also identified. **Table 1-1** through **Table 1-7** present the potential media-specific and route-specific exposure pathways for each receptor and each exposure area and provide the rationale for selection or exclusion of the exposure pathway in the BHHRA. **Figure 3** presents the human health exposure pathways for soils including source, affected environmental media, and receptor. **Figure 4** presents the human health exposure pathways for groundwater, surface water, sediments, and biota. **Figures 3** and **4** present a summary of the potential exposure pathways to human receptors throughout the Site. They also provide an overall perspective of the sources identified at the Site, the affected environmental media and fate and transport through the environment, and the Site-specific human receptors that may be exposed. Not all exposure pathways presented as complete in **Figure 3** and **Figure 4** are applicable to each of the exposure areas; they present a summary of all pathways for the entire Site. The reader should refer to the exposure area-specific complete exposure pathways in **Table 1-1** through **Table 1-7** for the complete exposure pathways identified for each exposure area.

3.1.1 Northern Property Exposure Areas

The Northern Property encompasses approximately 30 acres of the 98-acre Site and is divided into three exposure areas: the Operational Area, Slips, and Dry Dock Area (**Figure 5**). The Operational Area includes the land features within the extent of the Northern Property boundary and is comprised of all of IAI-4, and IAI-5, and the northern portion of IAC-4 and southern portion of IAI-8. The Northern Property Slips are surface water bodies including IAI-6 and IAI-7. The Northern Property Dry Dock includes the Dry



Dock (IAC-7). The following sections discuss the Northern Property Exposure Areas and potentially complete exposure pathways for each.

3.1.1.1 Northern Property Operational Area

The majority of the Operational Area is covered with grass with a narrow band of tress bordering most portions of the river bank. Four inactive buildings and gravel roadways remain on the property. An underground high-pressure pipeline conveying gas crosses the Operational Area from east to west from the Mermentau River south of the Dry Dock (IAI-7) and north of the existing building on IAI-4. The pipeline ranges in depth from approximately 4 ft bgs to approximately 20 ft bgs and is owned and maintained by Shell Oil Company.

As discussed, historical operations within this area included barge and vessel construction, repair, and cleaning operations. Residual asphaltic-like material was placed around the Northern Property Operational Area on roadways and other heavily utilized areas. There are no current commercial/industrial activities within the Northern Property Operational Area. A maintenance worker occasionally visits the site to perform surficial landscaping activities (e.g., cutting grass) or inspection of the land surface above the pipeline.

The property is secured by a locked fence; however, unrestricted access to the Operational Area on the Northern Property is possible from the slips and the Mermentau River. The topography of the Northern Property Operational Area is primarily level with a gentle slope to the north and east toward the Mermentau River. A small segment of the discharge ditch from IAI-8 crosses the southwest corner of the Northern Property; surface water and sediment are present within this feature after rain events.

While future development of the Northern Property Operational Area is not anticipated, there is the potential it could be utilized and/or redeveloped for future commercial/industrial activities. Based on the current and anticipated future uses of the property, the following receptors are identified for this exposure area:

- Current
 - Trespasser (adolescent child)
 - Recreational fisherman (adult/child) – along shoreline (i.e., not in slips)
 - Maintenance worker (e.g., lawn mower, pipeline land surface inspection)
- Future
 - Trespasser (adolescent child)
 - Recreational fisherman (adult/child) – along shoreline (i.e., not in slips)
 - Maintenance worker (e.g., lawn mower, pipeline land surface inspection)
 - Pipeline worker (e.g., subsurface pipeline work)
 - Commercial/industrial workers
 - Construction worker

Based on the potential migration pathways and receptors that may be exposed to COPCs at the Northern Property Operational Area, the following current and future potential exposure pathways are considered complete in the CEM (**Table 1-1**):

- Current and Future
 - Direct contact (incidental ingestion, inhalation, and dermal contact) with COPCs in soil



- Trespasser
 - Maintenance Worker
 - Recreational fisherman (adult/child)
- Direct contact (incidental ingestion and dermal contact) with COPCs in residual asphaltic-like material
 - Trespasser
 - Maintenance Worker
- Future Only
 - Direct contact (incidental ingestion, inhalation, and dermal contact) with COPCs in soil
 - Pipeline Worker
 - Commercial/Industrial Worker
 - Construction Worker
 - Direct contact (incidental ingestion and dermal contact) with COPCs in residual asphaltic-like material
 - Pipeline Worker
 - Commercial/Industrial Worker
 - Construction Worker

The following potential exposure pathways for receptors in the Northern Property Operational Area are considered incomplete for the CEM:

- Exposure of Recreational Fisherman to COPCs in residual asphaltic-like material via direct contact (incidental ingestion and dermal contact):
 - The Recreational Fisherman is anticipated to spend the majority of the time at the Site along the shoreline and have limited contact with residual asphaltic-like material distributed across the Northern Property Operational Area.
- Exposure of humans to COPCs in surface water and sediment via direct contact (incidental ingestion and dermal contact):
 - While a small segment of the drainage ditch from IAI-8 crosses the southern corner of the Northern Property, the drainage ditch is intermittently wetted.
- Exposure of human receptors (ingestion) with COPCs in biota:
 - There are no areas within the Northern Property Operational Area that have been or will be used for hunting. Recreational fisherman ingestion of biota will be evaluated for the Northern Property Slips exposure area.

3.1.1.2 Northern Property – Slips Area

The Northern Property Slips exposure area consists of the slip on the northern edge of the property (IAI-6) and on the eastern edge of the property (IAI-7). The slips are connected to the Mermentau River and, during previous investigations, fisherman (including families with children) were observed fishing within slips at the Site (EHS Support, 2018). When interviewed, the families indicated that they occasionally fish for catfish for consumption. Currently, the slips are not in use; however, there is the potential for future use as boating slips should the property be redeveloped.

Based on the current and anticipated future uses of the property, the following receptors are identified for this exposure area:

- Current



- Recreational Fisherman (adult/child) – (shoreline or boat)
- Future
 - Recreational Fisherman (adult/child) – (shoreline or boat)

Based on the potential migration pathways and receptors that may be exposed to COPCs at the Northern Property Slips, the following current and future potential exposure pathways are considered complete in the CEM (**Table 1-2**):

- Current and Future
 - Direct contact (incidental ingestion and dermal contact) with COPCs in surface water and sediment
 - Recreational fisherman (adult/child)
 - Direct contact (ingestion) with COPCs in biota
 - Recreational fisherman (adult/child)

The following potential exposure pathways for receptors in the Northern Property Slips are considered incomplete for the CEM:

- Exposure of Recreational Fisherman (adult/child) to COPCs in soil via direct contact (incidental ingestion, dermal contact, inhalation):
 - The Northern Property Slips exposure area is comprised entirely of surface water; therefore, there is no soil media within this exposure scenario.
- Exposure of commercial/industrial workers to COPCs in surface water and sediment via direct contact (incidental ingestion and dermal contact):
 - While there may be future commercial/industrial activities conducted within the Northern Property Slips, workers are anticipated to spend the majority of the time on land or on vessels. Therefore, contact with surface water and sediment would be minimal.

3.1.1.3 Northern Property Dry Dock

The Northern Property Dry Dock (IAC-7) exposure area consists of approximately 3 acres and is adjacent to the Mermentau River. Historically, this area was utilized as an access route for barges to enter and/or exit the Site, before or after construction, repair and/or cleaning operations were conducted. A metal structure was constructed at the eastern edge of the dry dock, which was used to inhibit influx of water from the Mermentau River, such that the dry dock area could be intermittently dewatered while work was performed within the area. The Northern Property Dry Dock is currently filled with surface water and the metal structure is currently in-place preventing direct access from the Mermentau River by boaters. The present functionality of the metal structure and pervasiveness of hydraulic connections between the water within the Dry Dock and the Mermentau River are unknown. While there are currently no plans for the metal structure to be removed, there is the potential for the metal structure to be removed in the future, which would allow for increased hydraulic connectivity with, and access by, boaters from the Mermentau River.

Based on the current and anticipated future uses of the property, the following receptors are identified for this exposure area:

- Current
 - Trespasser
- Future



- Trespasser
- Recreational fisherman (adult/child) – (shoreline or boat)

Based on the potential migration pathways and receptors that may be exposed to COPCs at the Northern Property Dry Dock, the following current and future potential exposure pathways are considered complete in the CEM (**Table 1-3**):

- Current and future
 - Direct contact (incidental ingestion and dermal contact) with COPCs in surface water and sediment
 - Trespasser
- Future only
 - Direct contact (incidental ingestion and dermal contact) with COPCs in surface water and sediment
 - Recreational fisherman (adult/child) – (shoreline or boat)
 - Direct contact (ingestion) with COPCs in biota
 - Recreational fisherman (adult/child)

The following potential exposure pathways for receptors in the Northern Property Dry Dock are considered incomplete for the CEM:

- Exposure of Trespassers and Recreational Fisherman (adult/child) to COPCs in soil via direct contact (incidental ingestion, dermal contact, inhalation)
 - The Northern Property Dry Dock exposure area is comprised entirely of surface water; therefore, there is no soil within this exposure scenario.

3.1.2 Southern Property Exposure Areas

The Southern Property consists of approximately 68 acre and is primarily level, with an overriding gentle slope to the south and east toward the Mermentau River. The exposure areas for the Southern Property include the Operational Area, Slip, and Wetland Areas (**Figure 5**). The Operational Area includes the land features within the extent of the Southern Property boundary, excluding the wetlands, and is comprised of all of IAC-1, IAC-2, IAC-3, IAI-2, and IAI-3 and southern portion of IAI-8 and southern portion of IAC-4. The Southern Property Slip is the Barge Slip (IAC-6) and is a surface water body. The Southern Property Wetland Areas include the IAI-1 and IAC-5 and a portion of IAC-4. The following sections discuss the Southern Property Exposure Areas and potentially complete exposure pathways for each.

3.1.2.1 Southern Property – Operational Area

As discussed in **Section 3**, the Southern Property was historically used for barge cleaning operations. The Operational Area consists of all of IAC-1, IAC-2, IAC-3, IAI-3, and portions of IAC-4 and IAI-8. Historical operations in this area included storage of barge cleaning residuals in a partially-buried barge (IAC-1) and surface impoundments in IAC-3, generation of steam for barge cleaning activities in a boiler barge and AST (IAC-2) and disposal of waste materials in the Historical Waste Storage Area (IAC-4). No other buildings or structures are present within the Southern Property Operational Area. Residual asphaltic-like material was also placed around the Southern Property Operational Area on roadways and other heavily utilized areas (**Figure 5**). The source of the residual asphaltic-like material distributed across the Southern Property Operational Area is believed to be from residuals in the barges and/or



impoundments. A USEPA removal action removed pumpable residuals within the barges (EHS Support, 2018); remaining residual within the barge is comparable to the residual asphaltic-like material distributed across the Site. Accessibility to the partially-buried barge is limited due to structural hazards and compartmentalization. While sheep and cattle were previously observed in the Southern Property Operational Area, the access to the Site by livestock and farmers is currently restricted to farmers by a locked fence.

The Mermentau River borders the Southern Property Operational Area to the east and south. Similar to the Northern Property Operational Area, an underground high-pressure pipeline conveying gas crosses the Southern Property Operational Area from east to west from the Mermentau River north of the Barge Cleaning Ditch (IAC-5). The pipeline ranges in depth from approximately 4 ft bgs to approximately 20 ft bgs and is owned and maintained by Shell. The property is secured by a locked fence; however, unrestricted access to the Operational Area on the Southern Property is possible from the southern wetlands areas, the Barge Slip, and the Mermentau River.

While future development of the Southern Property Operational Area is not anticipated, there is the potential it could be utilized and/or redeveloped for future commercial/industrial activities. Based on the current and anticipated future uses of the property, the following receptors are identified for this exposure area:

- Current
 - Trespasser (adolescent child)
 - Recreational fisherman (adult/child) – along shoreline (i.e., not in slip)
 - Maintenance worker (e.g., lawn mower, pipeline land surface inspection)
- Future
 - Trespasser (adolescent child)
 - Recreational fisherman (adult/child) – along shoreline (i.e., not in slip)
 - Maintenance worker (e.g., lawn mower, pipeline land surface inspection)
 - Pipeline worker (e.g., subsurface pipeline work)
 - Commercial/industrial workers
 - Construction worker

Based on the potential migration pathways and receptors that may be exposed to COPCs at the Southern Property Operational Area, the following current and future potential exposure pathways are considered complete in the CEM (**Table 1-4**):

- Current and Future
 - Direct contact (incidental ingestion, inhalation, and dermal contact) with COPCs in soil
 - Trespasser
 - Maintenance Worker
 - Recreational fisherman (adult/child) – along shoreline (i.e., not in slip)
 - Direct contact (incidental ingestion and dermal contact) with COPCs in residual asphaltic-like material
 - Trespasser
 - Maintenance Worker
 - Direct contact (incidental ingestion and dermal contact) with COPCs in surface water and sediment
 - Trespasser



- Maintenance Worker
- Future Only
 - Direct contact (incidental ingestion, inhalation, and dermal contact) with COPCs in soil
 - Pipeline Worker
 - Commercial/Industrial Worker
 - Construction Worker
 - Direct contact (incidental ingestion and dermal contact) with COPCs in surface water and sediment
 - Pipeline Worker
 - Commercial/Industrial Worker
 - Construction Worker

The following potential exposure pathways for receptors in the Southern Property Operational Area are considered incomplete for the CEM:

- Exposure of human receptors (ingestion) with COPCs in biota:
 - There are no areas within the Southern Property Operational Area that have been or will be used by a recreational trespasser (hunting). Recreational fisherman ingestion of biota will be evaluated for the Southern Property Slips exposure area.
- Exposure of Recreational Fisherman (adult/child) to COPCs in surface water and sediment via direct contact (incidental ingestion and dermal contact):
 - Recreational fisherman (adult/child) are anticipated to spend the majority of their time on the Operational Area along the shoreline of the Mermentau River and the Southern Property Slip and time spent within the Operational Area proper is expected to be limited. Therefore, potential exposure to COPCs in surface water and sediment found within the interior of the Southern Property Operational Area (e.g., IAI-8) via direct contact is considered insignificant.

3.1.2.2 Southern Property – Barge Slip Area

The Southern Property Slip Area is approximately 5 acres and is comprised entirely of the 150-foot wide Barge Slip (IAC-6) (**Figure 5**). The Barge Slip (IAC-6) is covered entirely with water and is connected to the Mermentau River on the eastern end. During previous investigations, the water depth was recorded from 12 to 14 feet deep at the center of the slip (EHS Support, 2018).

When the Site was operational, the Barge Slip was used as an access route for barges to enter and/or exit the Site and for storage before or after cleaning operations. Historically, families were observed fishing in the slip and noted that they consume catfish caught within the Barge Slip (EHS Support, 2018). There are no current operations conducted within the Southern Property Slip; however, there is the potential in the future for the slip to be utilized during commercial/industrial activities.

Based on the current and anticipated future uses of the property, the following receptors are identified for the Southern Property Slip exposure area:

- Current
 - Recreational fisherman (adult/child) – (shoreline or boat)
- Future
 - Recreational fisherman (adult/child) – (shoreline or boat))



Based on the potential migration pathways and receptors that may be exposed to COPCs at the Southern Property Slip, the following current and future potential exposure pathways are considered complete in the CEM (**Table 1-5**):

- Direct contact (incidental ingestion and dermal contact) with COPCs in surface water and sediment
 - Recreational fisherman (adult/child)
- Direct contact (ingestion) with COPCs in biota
 - Recreational fisherman (adult/child)

The following potential exposure pathways for receptors in the Southern Property Slip are considered incomplete for the CEM:

- Exposure of Recreational Fisherman (adult/child) to COPCs in soil via direct contact (incidental ingestion, dermal contact, inhalation):
 - The Southern Property Barge Slip exposure area is comprised entirely of surface water; therefore, there is no soil within this exposure scenario.
- Exposure of Commercial/Industrial Workers to COPCs in surface water and sediment via direct contact (incidental ingestion and dermal contact)
 - While there may be future commercial/industrial activities conducted within the Southern Property, Barge Slip workers are anticipated to spend the majority of the time on land or on vessels. Therefore, contact with surface water and sediment would be minimal.

3.1.2.3 Southern Property – Wetland Areas

Three wetlands areas are present on the Southern Property and include IAI-1, IAC-5, and a portion of IAC-4. Additionally, a portion of IAI-8 crosses the northern portion of the Southern Property and is intermittently wetted (**Figure 5**). The Southern Wetland Area (IAI-1) is identified by the United States Fish and Wildlife Service National Wetlands Inventory as an approximately 25-acre palustrine forested wetlands (PFO). The wetland is believed to be inundated throughout the growing season in most years. During periods when surface water is not present, the soils are saturated at or very near the ground surface. A variety of wildlife habitats are supported by the PFO wetland including fish communities. The IAC-5 drainage ditch continues southeast and has an earthen berm at the confluence with the Mermentau River, physically blocking connectivity with the River (**Figure 5**). Water depths of approximately 1.6 to 2.5 ft were observed in the IAC-5 drainage ditch during the 2018 RI/FS investigation activities (EHS Support, 2019). The IAC-5 drainage ditch is heavily vegetated with emergent and floating aquatic vegetation, overhanging brush, and saplings, requiring routine maintenance (i.e., brush hogging) by pipeline personnel to maintain the pipeline right of-way. Given the connectivity of IAC-5 to the Southern Wetland (IAI-1) to the west, it is likely that similar aquatic communities are present in the drainage ditch as are present in the adjacent Southern Wetland Area. While fish communities are present with this exposure area, access to the wetlands by fisherman is inhibited due to thick vegetation.

The IAC-4 wetland is considered an emergent wetland unlikely to support fish species. Additionally, it is interior to IAC-4 and not connected to the Southern Wetlands Area or the Mermentau River. Therefore, fishing activities are not anticipated in this wetland area.



Based on the current and anticipated future uses of the property, the following receptors are identified for the Southern Property Wetland Area exposure area:

- Current
 - Trespasser
- Future
 - Trespasser
 - Pipeline Worker

Based on the potential migration pathways and receptors that may be exposed to COPCs at the Southern Property Wetland Areas, the following current and future potential exposure pathways are considered complete in the CEM (**Table 1-6**):

- Direct contact (incidental ingestion and dermal contact) with COPCs in surface water and sediment
 - Trespasser
 - Pipeline Worker

The following potential exposure pathway for receptors in the Southern Property Wetland Areas is considered incomplete for the CEM:

- Exposure of Recreational Fisherman (adult/child) to COPCs via direct contact and incidental ingestion of surface water and sediment and direct contact (ingestion) of biota:
 - The wetlands areas do not provide suitable and viable fishing habitats for game species. Additionally, accessibility within the wetlands area is limited due to thick vegetation.

3.1.3 Groundwater

Groundwater is present beneath the Site at depths ranging from 2 ft bgs to 12 ft bgs. Groundwater across the Site will be evaluated as one exposure area. There are no current operations on-site, no potable or industrial wells on the Site, and no known domestic water wells within 0.25 mile of the Site (EHS Support, 2018); therefore, there are no current receptors potentially exposed to COPCs in groundwater via direct contact. Given the presence of volatiles within groundwater, there is the potential for vapors to migrate through the subsurface to ambient or indoor air. In the future scenario, on-site receptors potentially exposed to COPCs in shallow groundwater include workers and construction workers.

Based on the regional geology information presented in the RI/FS Work Plan (EHS Support, 2018; **Section** Error! Reference source not found.), there are no shallow sand water bearing zones within the Prairie Complex Confining Unit and the yield from the existing silts and clay is too low to support potable use. Therefore, there are no potentially complete receptors for potable use for groundwater either on- or off-site.

In 2013 and 2018, light non-aqueous phase liquid (LNAPL) was observed in MW-2. The RI/FS investigation activities evaluated the presence of LNAPL in groundwater. During the RI/FS investigation activities, LNAPL was also observed in MW-7, which is located in close proximity to MW-2. Receptors potentially exposed to LNAPL will be consistent with those potentially exposed to COPCs in groundwater on the Site, which are on-site workers and construction workers in the future scenario.



Based on the current and anticipated future uses of the property, the following receptors are identified for the site-wide groundwater exposure area:

- Current
 - Maintenance worker
 - Trespasser
- Future
 - Maintenance worker
 - Trespasser
 - Pipeline worker
 - Commercial/Industrial Worker
 - Construction Worker

Based on the potential migration pathways and receptors that may be exposed to COPCs at the Groundwater Exposure Area, the following current and future potential exposure pathways are considered complete in the CEM (**Table 1-7**):

- Current and Future
 - Inhalation of COPCs in Site groundwater and LNAPL via volatilization of COPCs to ambient air
 - Trespasser
 - Maintenance Worker
- Future only
 - Direct contact (incidental ingestion and dermal contact) with COPCs in groundwater and LNAPL
 - Pipeline Worker
 - Construction Worker
 - Inhalation of COPCs in Site groundwater and LNAPL via volatilization of COPCs to ambient air
 - Pipeline Worker
 - Commercial/Industrial Worker
 - Construction Worker
 - Inhalation of COPCs in Site groundwater and LNAPL via volatilization of COPCs to indoor air
 - Commercial/Industrial Worker

The following potential exposure pathways for receptors in the Groundwater Exposure Area are considered incomplete for the CEM:

- Exposure of all receptors to COPCs in groundwater via use of the Prairie Complex Confining Unit groundwater as a potable water source:
 - There are no shallow sand water bearing zones within the Prairie Terrace Complex Unit and the yield from the existing silts and clay is too low to support potable use.
- Exposure of Trespassers, Maintenance Workers, Pipeline Workers, and Construction Worker via inhalation to COPCs in Site groundwater and LNAPL via volatilization to indoor air:
 - These receptors are anticipated to spend the majority of the time outside of future buildings.
- Exposure of Recreational Fisherman (adult/child) via inhalation to COPCs in Site groundwater and LNAPL via volatilization of COPCs:
 - Recreational fisherman (adult/child) are anticipated to spend the majority of their time along the shoreline of the Mermentau River and the connected surface water bodies (i.e., slips) and time spent within the interior of the Site is expected to be limited. The surface



water bodies will act as a barrier to potential migration of COPCs from the subsurface to ambient air. Therefore, potential exposure to COPCs in groundwater and soil via inhalation is considered insignificant.

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6 References

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Tables

Table 1-1
Selection of Exposure Pathways - Northern Property - Operational Area (Exposure Area 1)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Northern Property – Operational Area (Exposure Area 1)	Current	Soil	Surface soil (0-1 ft bgs)	Soil	Trespasser	Adolescent (6 to 16 years)	Ig D Ip	Quantitative	Trespasser exposed during unauthorized activities.
			Surface soil (0-1 ft bgs)	Soil	Maintenance Worker	Adult	Ig D Ip	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Surface soil (0-1 ft bgs)	Soil	Commercial/Industrial Worker	Adult	Ig D Ip	None	There are no commercial/industrial activities occurring currently at the Site.
			Surface soil (0-1 ft bgs)	Soil	Pipeline Worker	Adult	Ig D Ip	None	There is no current subsurface pipeline activity.
			Surface soil (0-1 ft bgs)	Soil	Construction Worker	Adult	Ig D Ip	None	Property is currently undeveloped with no current construction. activities.
			Surface soil (0-1 ft bgs)	Soil	Resident	Adult/Child	Ig D Ip	None	Property is currently undeveloped.
			Surface soil (0-1 ft bgs)	Soil	Recreational Fisherman	Adult/Child	Ig D Ip	Quantitative	There are recreational use areas within the Northern Property Operational Area (i.e., fishing from the shoreline of the slips).
			Surface soil (0-1 ft bgs)	Biota	Recreational Fisherman	Adult/Child	Ig	None	There are no recreational use areas within the Northern Property Operational Area that have been be used for hunting.
			Outdoor Air	Air	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities.
			Outdoor Air	Air	Maintenance Worker	Adult	Iv	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Outdoor Air	Air	Commercial/Industrial Worker	Adult	Iv	None	There are no commercial/industrial activities occurring currently at the Site.
			Outdoor Air	Air	Pipeline Worker	Adult	Iv	None	There is no current subsurface pipeline activity.
			Outdoor Air	Air	Construction Worker	Adult	Iv	None	Property is currently undeveloped with no current construction. activities.
			Outdoor Air	Air	Resident	Adult/Child	Iv	None	Property is currently undeveloped.
			Outdoor Air	Air	Recreational Fisherman	Adult/Child	Iv	Quantitative	There are recreational use areas within the Northern Property Operational Area (i.e., fishing from the shoreline of the slips).
		Residual Asphaltic Material	Residual Asphaltic Material	Residual Asphaltic Material	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	Trespasser exposed during unauthorized activities.
			Residual Asphaltic Material	Residual Asphaltic Material	Maintenance Worker	Adult	Ig D	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Residual Asphaltic Material	Residual Asphaltic Material	Commercial/Industrial Worker	Adult	Ig D	None	There are no commercial/industrial activities occurring currently at the Site.
			Residual Asphaltic Material	Residual Asphaltic Material	Pipeline Worker	Adult	Ig D	None	There is no current subsurface pipeline activity.

Table 1-1
Selection of Exposure Pathways - Northern Property - Operational Area (Exposure Area 1)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Northern Property – Operational Area (Exposure Area 1)	Current	Residual Asphaltic Material	Residual Asphaltic Material	Residual Asphaltic Material	Construction Worker	Adult	Ig D	None	Property is currently undeveloped with no current construction. activities.
			Residual Asphaltic Material	Residual Asphaltic Material	Resident	Adult/Child	Ig D	None	Property is currently undeveloped.
			Residual Asphaltic Material	Residual Asphaltic Material	Recreational Fisherman	Adult/Child	Ig D	None	The recreational fishermen are not expected to spend time in areas where the residual asphaltic material was spread.
		Surface Water	Surface Water	Surface water	All	All	Ig D	None	A drainage ditch is present within the southern portion of the Northern Property Operational Area. However, this area is intermittently wetted and is unlikely to support aquatic environments.
		Sediment	Sediment	Sediment	All	All	Ig D	None	A drainage ditch is present within the southern portion of the Northern Property Operational Area. However, this area is intermittently wetted and is unlikely to support aquatic environments.
Northern Property – Operational Area (Exposure Area 1)	Future	Soil	Subsurface soil (0-12 ft bgs)	Soil	Trespasser	Adolescent (6 to 16 years)	Ig D Ip	Quantitative	Trespasser exposed during unauthorized activities.
			Subsurface soil (0-12 ft bgs)	Soil	Maintenance Worker	Adult	Ig D Ip	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Subsurface soil (0-12 ft bgs)	Soil	Pipeline Worker	Adult	Ig D Ip	Quantitative	Potential future subsurface pipeline work.
			Subsurface soil (0-12 ft bgs)	Soil	Commercial/Industrial Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Subsurface soil (0-12 ft bgs)	Soil	Construction Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Subsurface soil (0-12 ft bgs)	Soil	Resident	Adult/Child	Ig D Ip	None	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Subsurface soil (0-12 ft bgs)	Soil	Recreational Fisherman	Adult/Child	Ig D Ip	Quantitative	There are recreational use areas within the Northern Property Operational Area (i.e., fishing from the shoreline of the slips).
			Subsurface soil (0-12 ft bgs)	Biota	Recreational Fisherman	Adult/Child	Ig	None	There are no recreational use areas within the Northern Property Operational Area that have been be used for hunting.
		Outdoor Air	Outdoor Air	Air	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities.
			Outdoor Air	Air	Maintenance Worker	Adult	Iv	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Outdoor Air	Air	Pipeline Worker	Adult	Iv	Quantitative	Potential future subsurface pipeline work.

Table 1-1
Selection of Exposure Pathways - Northern Property - Operational Area (Exposure Area 1)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Northern Property – Operational Area (Exposure Area 1)	Future	Soil	Outdoor Air	Air	Commercial/Industrial Worker	Adult	Iv	Quantitative	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Outdoor Air	Air	Construction Worker	Adult	Iv	Quantitative	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Outdoor Air	Air	Resident	Adult/Child	Iv	None	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Outdoor Air	Air	Recreational Fisherman	Adult/Child	Iv	None	There are recreational use areas within the Northern Property Operational Area (i.e., fishing from the shoreline of the slips).
Northern Property – Operational Area (Exposure Area 1)	Future	Residual Asphaltic Material	Residual Asphaltic Material	Residual Asphaltic Material	Trespasser	Adolescent (6 to 16 years)	Ig D Ip	Quantitative	Trespasser exposed during unauthorized activities.
			Residual Asphaltic Material	Residual Asphaltic Material	Maintenance Worker	Adult	Ig D Ip	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Residual Asphaltic Material	Residual Asphaltic Material	Pipeline Worker	Adult	Ig D Ip	Quantitative	Potential future subsurface pipeline work.
			Residual Asphaltic Material	Residual Asphaltic Material	Commercial/Industrial Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Residual Asphaltic Material	Residual Asphaltic Material	Construction Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Residual Asphaltic Material	Residual Asphaltic Material	Resident	Adult/Child	Ig D Ip	None	Potential for future development of Northern Property Operational Area for commercial/industrial purposes only.
			Residual Asphaltic Material	Residual Asphaltic Material	Recreational Fisherman	Adult/Child	Ig D Ip	None	The recreational fishermen are not expected to spend time in areas where the residual asphaltic material was spread.
		Surface Water	Surface Water	Surface water	All	All	Ig D	None	A drainage ditch is present within the southern portion of the Northern Property Operational Area. However, this area is intermittently wetted and is unlikely to support aquatic environments.
		Sediment	Sediment	Sediment	All	All	Ig D	None	A drainage ditch is present within the southern portion of the Northern Property Operational Area. However, this area is intermittently wetted and is unlikely to support aquatic environments.

Notes:
a/ Ip = inhalation of particulate; Iv = inhalation of volatiles; D = dermal; Ig = ingestion

Table 1-2
Selection of Exposure Pathways - Northern Property - Slips Area (Exposure Area 2)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Northern Property – Slips Area (Exposure Area 2)	Current	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the adjacent Mermentau River. Access to the slips is not restricted from the river.
				Biota	Recreational Fisherman	Adult/Child	Ig	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the adjacent Mermentau River. Access to the slips is not restricted from the river.
		Sediment	Sediment	Sediment	Recreational Fisherman	Adult/Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the adjacent Mermentau River. Access to the slips is not restricted from the river.
Northern Property – Slips Area (Exposure Area 2)	Future	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the adjacent Mermentau River. Access to the slips is not restricted from the river.
				Biota	Recreational Fisherman	Adult/Child	Ig	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the adjacent Mermentau River. Access to the slips is not restricted from the river.
		Sediment	Sediment	Sediment	Recreational Fisherman	Adult/Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the adjacent Mermentau River. Access to the slips is not restricted from the river.

Notes:
a/ D = dermal; Ig = ingestion

Table 1-3
Selection of Exposure Pathways - Northern Property - Dry Dock Area (Exposure Area 3)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Northern Property – Dry Dock Area (Exposure Area 3)	Current	Surface Water	Surface Water	Surface water	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	A trespasser may access the Dry Dock Area via the Site.
	Current	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/ Child	Ig D	None	Access to the Dry Dock area is restricted from the river.
				Biota	Recreational Fisherman	Adult/ Child	Ig	None	Access to the Dry Dock area is restricted from the river.
		Sediment	Sediment	Sediment	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	A Trespasser may access the Dry Dock Area via the Site.
					Recreational Fisherman	Adult/ Child	Ig D	None	Access to the Dry Dock area is restricted from the river.
Northern Property – Dry Dock Area (Exposure Area 3)	Future	Surface Water	Surface Water	Surface water	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	A trespasser may access the Dry Dock Area via the Site.
	Future	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/ Child	Ig D	Quantitative	The metal structure restricting access to the Dry Dock Area may be removed as a result of future redevelopment activities. Recreational activities (i.e., boating and fishing) similar to those observed in the slips on the Site may occur once access to the dry dock is not restricted from the river.
				Biota	Recreational Fisherman	Adult/ Child	Ig	Quantitative	The metal structure restricting access to the Dry Dock Area may be removed as a result of future redevelopment activities. Recreational activities (i.e., boating and fishing) similar to those observed in the slips on the Site may occur once access to the dry dock is not restricted from the river.
		Sediment	Sediment	Sediment	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	The metal structure restricting access to the Dry Dock Area may be removed as a result of future redevelopment activities. Recreational activities (i.e., boating and fishing) similar to those observed in the slips on the Site may occur once access to the dry dock is not restricted from the river.
					Recreational Fisherman	Adult/ Child	Ig D	Quantitative	The metal structure restricting access to the Dry Dock Area may be removed as a result of future redevelopment activities. Recreational activities (i.e., boating and fishing) similar to those observed in the slips on the Site may occur once access to the dry dock is not restricted from the river.

Notes:
a/ D = dermal; Ig = ingestion

Table 1-4
Selection of Exposure Pathways -Southern Property - Operational Area (Exposure Area 4)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Southern Property – Operational Area (Exposure Area 4)	Current	Soil	Surface soil (0-1 ft bgs)	Soil	Trespasser	Adolescent (6 to 16 years)	Ig D Ip	Quantitative	Trespasser exposed during unauthorized activities
			Surface soil (0-1 ft bgs)	Soil	Maintenance Worker	Adult	Ig D Ip	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Surface soil (0-1 ft bgs)	Soil	Commercial/Industrial Worker	Adult	Ig D Ip	None	There are no commercial/industrial activities occurring currently at the Site.
			Surface soil (0-1 ft bgs)	Soil	Pipeline Worker	Adult	Ig D Ip	None	There is no current subsurface pipeline activity.
			Surface soil (0-1 ft bgs)	Soil	Construction Worker	Adult	Ig D Ip	None	Property is currently undeveloped with no current construction activities.
			Surface soil (0-1 ft bgs)	Soil	Resident	Adult/Child	Ig D Ip	None	Property is currently undeveloped.
			Surface soil (0-1 ft bgs)	Soil	Recreational Fisherman	Adult/Child	Ig D Ip	Quantitative	There are recreational use areas within the Southern Property Operational Area (i.e., fishing from the shoreline of the slips)
			Surface soil (0-1 ft bgs)	Biota	Recreational Fisherman	Adult/Child	Ig	None	There are no recreational use areas within the Southern Property Operational Area that have been be used for hunting.
			Outdoor Air	Air	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities
			Outdoor Air	Air	Maintenance Worker	Adult	Iv	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Outdoor Air	Air	Commercial/Industrial Worker	Adult	Iv	None	There are no commercial/industrial activities occurring currently at the Site.
			Outdoor Air	Air	Pipeline Worker	Adult	Iv	None	There is no current subsurface pipeline activity.
			Outdoor Air	Air	Construction Worker	Adult	Iv	None	Property is currently undeveloped with no current construction activities.
			Outdoor Air	Air	Resident	Adult/Child	Iv	None	Property is currently undeveloped.
			Outdoor Air	Air	Recreational Fisherman	Adult/Child	Iv	Quantitative	There are recreational use areas within the Southern Property Operational Area (i.e., fishing from the shoreline of the slips)
		Residual Asphaltic Material	Residual Asphaltic Material	Residual Asphaltic Material	Trespasser	Adolescent (6 to 16 years)	Ig D Ip	Quantitative	Trespasser exposed during unauthorized activities
			Residual Asphaltic Material	Residual Asphaltic Material	Maintenance Worker	Adult	Ig D Ip	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Residual Asphaltic Material	Residual Asphaltic Material	Commercial/Industrial Worker	Adult	Ig D Ip	None	There are no commercial/industrial activities occurring currently at the Site.
			Residual Asphaltic Material	Residual Asphaltic Material	Pipeline Worker	Adult	Ig D Ip	None	There is no current subsurface pipeline activity.
			Residual Asphaltic Material	Residual Asphaltic Material	Construction Worker	Adult	Ig D Ip	None	Property is currently undeveloped with no current construction activities.
			Residual Asphaltic Material	Residual Asphaltic Material	Resident	Adult/Child	Ig D Ip	None	Property is currently undeveloped.
			Residual Asphaltic Material	Residual Asphaltic Material	Recreational Fisherman	Adult/Child	Ig D Ip	None	The recreational fishermen are not expected to spend time in areas where the residual asphaltic material was spread.

Table 1-4
Selection of Exposure Pathways -Southern Property - Operational Area (Exposure Area 4)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Southern Property – Operational Area (Exposure Area 4)	Current	Surface Water	Surface Water	Surface water	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, a former surface impoundment within IAC-3 (Water Pit 3) is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats.
			Surface Water	Surface water	Maintenance Worker	Adult	Ig D	Quantitative	Maintenance of landscape and operational areas occurs currently at the Site; however, no maintenance activities occur within the Water Pit of IAC-3.
			Surface Water	Surface water	Commercial/Industrial Worker	Adult	Ig D	None	There are no commercial/industrial activities occurring currently at the Site.
			Surface Water	Surface water	Pipeline Worker	Adult	Ig D	None	There is no current subsurface pipeline activity.
			Surface Water	Surface water	Construction Worker	Adult	Ig D	None	Property is currently undeveloped with no current construction activities.
			Surface Water	Surface water	Resident	Adult/Child	Ig D	None	Property is currently undeveloped.
			Surface Water	Surface water	Recreational Fisherman	Adult/Child	Ig D	None	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, a former surface impoundment within IAC-3 (Water Pit 3) is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats.
		Sediment	Sediment	Sediment	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, a former surface impoundment within IAC-3 (Water Pit 3) is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats.
			Sediment	Sediment	Maintenance Worker	Adult	Ig D	Quantitative	Maintenance of landscape and operational areas occurs currently at the Site; however, no maintenance activities occur within the Water Pit of IAC-3.
			Sediment	Sediment	Commercial/Industrial Worker	Adult	Ig D	None	There are no commercial/industrial activities occurring currently at the Site.
			Sediment	Sediment	Pipeline Worker	Adult	Ig D	None	There is no current subsurface pipeline activity.
			Sediment	Sediment	Construction Worker	Adult	Ig D	None	Property is currently undeveloped with no current construction activities.
			Sediment	Sediment	Resident	Adult/Child	Ig D	None	Property is currently undeveloped.
			Sediment	Sediment	Recreational Fisherman	Adolescent (6 to 16 years)	Ig D	None	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, IAC-3 is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats and is not conducive to fishing.
Southern Property – Operational Area (Exposure Area 4)	Future	Soil	Subsurface soil (0-12 ft bgs)	Soil	Trespasser	Adolescent (6 to 16 years)	Ig D Ip	Quantitative	Trespasser exposed during unauthorized activities
			Subsurface soil (0-12 ft bgs)	Soil	Maintenance Worker	Adult	Ig D Ip	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Subsurface soil (0-12 ft bgs)	Soil	Pipeline Worker	Adult	Ig D Ip	Quantitative	Potential future subsurface pipeline work
			Subsurface soil (0-12 ft bgs)	Soil	Commercial/Industrial Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Subsurface soil (0-12 ft bgs)	Soil	Construction Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.

Table 1-4
Selection of Exposure Pathways -Southern Property - Operational Area (Exposure Area 4)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Southern Property – Operational Area (Exposure Area 4)	Future	Soil	Subsurface soil (0-12 ft bgs)	Soil	Resident	Adult/Child	Ig D Ip	None	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Subsurface soil (0-12 ft bgs)	Soil	Recreational Fisherman	Adult/ Child	Ig D Ip	Quantitative	There are recreational use areas within the Southern Property Operational Area (i.e., fishing from the shoreline of the slips)
			Subsurface soil (0-12 ft bgs)	Biota	Recreational Fisherman	Adult/ Child	Ig	None	There are no recreational use areas within the Southern Property Operational Area that have been be used for hunting.
			Outdoor Air	Air	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities
			Outdoor Air	Air	Maintenance Worker	Adult	Iv	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Outdoor Air	Air	Pipeline Worker	Adult	Iv	Quantitative	Potential future subsurface pipeline work
			Outdoor Air	Air	Commercial/Industrial Worker	Adult	Iv	Quantitative	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Outdoor Air	Air	Construction Worker	Adult	Iv	Quantitative	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Outdoor Air	Air	Resident	Adult/Child	Iv	None	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Outdoor Air	Air	Recreational Fisherman	Adult/ Child	Iv	None	There are recreational use areas within the Southern Property Operational Area (i.e., fishing from the shoreline of the slips)
		Residual Asphaltic Material	Residual Asphaltic Material	Residual Asphaltic Material	Trespasser	Adolescent (6 to 16 years)	Ig D Ip	Quantitative	Trespasser exposed during unauthorized activities
			Residual Asphaltic Material	Residual Asphaltic Material	Maintenance Worker	Adult	Ig D Ip	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Residual Asphaltic Material	Residual Asphaltic Material	Pipeline Worker	Adult	Ig D Ip	Quantitative	Potential future subsurface pipeline work
			Residual Asphaltic Material	Residual Asphaltic Material	Commercial/Industrial Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Residual Asphaltic Material	Residual Asphaltic Material	Construction Worker	Adult	Ig D Ip	Quantitative	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Residual Asphaltic Material	Residual Asphaltic Material	Resident	Adult/Child	Ig D Ip	None	Potential for future development of Southern Property Operational Area for commercial/indsturlal purposes only.
			Residual Asphaltic Material	Residual Asphaltic Material	Recreational Fisherman	Adult/ Child	Ig D Ip	Quantitative	There are recreational use areas within the Southern Property Operational Area (i.e., fishing from the shoreline of the slips)
			Surface Water	Surface water	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, a former surface impoundment within IAC-3 (Water Pit 3) is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats.
		Surface Water	Surface Water	Surface water	Maintenance Worker	Adult	Ig D	Quantitative	Maintenance of landscape and operational areas occurs currently at the Site; however, no maintenance activities occur within the Water Pit of IAC-3.

Table 1-4
Selection of Exposure Pathways -Southern Property - Operational Area (Exposure Area 4)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Southern Property – Operational Area (Exposure Area 4)	Future	Surface Water	Surface Water	Surface water	Commercial/Industrial Worker	Adult	Ig D	Quantitative	The property may be redeveloped for commercial/industrial activities and there is the potential for contact with surface water within the portion of IAI-8. However, it is unlikely that the former Water Pit 3 area of IAC-3 would be redeveloped for commercial/industrial use.
			Surface Water	Surface water	Pipeline Worker	Adult	Ig D	Quantitative	The pipeline intersects water bodies within the Southern Property Operational Area.
			Surface Water	Surface water	Construction Worker	Adult	Ig D	None	The property may be redeveloped for commercial/industrial activities and there is the potential for contact with surface water within the portion of IAI-8. However, it is unlikely that the former Water Pit 3 area of IAC-3 would be redeveloped for commercial/industrial use.
			Surface Water	Surface water	Resident	Adult/Child	Ig D	None	The property may be redeveloped for commercial/industrial use only.
			Surface Water	Surface water	Recreational Fisherman	Adult/Child	Ig D	None	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, a former surface impoundment within IAC-3 (Water Pit 3) is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats.
		Sediment	Sediment	Sediment	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, a former surface impoundment within IAC-3 (Water Pit 3) is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats.
			Sediment	Sediment	Maintenance Worker	Adult	Ig D	Quantitative	Maintenance of landscape and operational areas occurs currently at the Site; however, no maintenance activities occur within the Water Pit of IAC-3.
			Sediment	Sediment	Commercial/Industrial Worker	Adult	Ig D	None	The property may be redeveloped for commercial/industrial activities and there is the potential for contact with surface water within the portion of IAI-8. However, it is unlikely that the former Water Pit 3 area of IAC-3 would be redeveloped for commercial/industrial use.
			Sediment	Sediment	Pipeline Worker	Adult	Ig D	Quantitative	The pipeline intersects water bodies within the Southern Property Operational Area.
			Sediment	Sediment	Construction Worker	Adult	Ig D	None	The property may be redeveloped for commercial/industrial activities and there is the potential for contact with surface water within the portion of IAI-8. However, it is unlikely that the former Water Pit 3 area of IAC-3 would be redeveloped for commercial/industrial use.
			Sediment	Sediment	Resident	Adult/Child	Ig D	None	The property may be redeveloped for commercial/industrial use only.
			Sediment	Sediment	Recreational Fisherman	Adolescent (6 to 16 years)	Ig D	None	A drainage ditch is present within the northern portion of the Southern Property Operational Area. Additionally, a former surface impoundment within IAC-3 (Water Pit 3) is continuously inundated by water. Due to the stagnant conditions it is unlikely to support fish habitats.

Notes:
1. Ip = inhalation of particulate; Iv = inhalation of volatiles; D = dermal; Ig = ingestion

Table 1-5
Selection of Exposure Pathways - Southern Property - Barge Slip Area (Exposure Area 5)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Southern Property – Barge Slip Area (Exposure Area 5)	Current	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/ Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the Barge Slip and adjacent Mermentau River. Access to the slips is not restricted from the river.
				Biota	Recreational Fisherman	Adult/ Child	Ig	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the Barge Slip and adjacent Mermentau River. Access to the slips is not restricted from the river.
		Sediment	Sediment	Sediment	Recreational Fisherman	Adult/ Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the Barge Slip and adjacent Mermentau River. Access to the slips is not restricted from the river.
Southern Property – Barge Slip Area (Exposure Area 5)	Future	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/ Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the Barge Slip and adjacent Mermentau River. Access to the slips is not restricted from the river.
				Biota	Recreational Fisherman	Adult/ Child	Ig	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the Barge Slip and adjacent Mermentau River. Access to the slips is not restricted from the river.
		Sediment	Sediment	Sediment	Recreational Fisherman	Adult/ Child	Ig D	Quantitative	Recreational activities (i.e., boating and fishing) have been observed within the Barge Slip and adjacent Mermentau River. Access to the slips is not restricted from the river.

Notes:
a/ D = dermal; Ig = ingestion

Table 1-6
Selection of Exposure Pathways - Southern Property - Wetlands Area (Exposure Area 6)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Southern Property – Wetlands Area (Exposure Area 6)	Current	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/ Child	Ig D	None	Recreational activities (i.e., fishing) not anticipated to occur within the wetlands areas.
				Surface water	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	Trespasser may access wetlands areas via Site.
				Surface water	Pipeline Worker	Adult	Ig D	None	No current pipeline work within this area.
				Biota	Recreational Fisherman	Adult/ Child	Ig	None	Recreational activities (i.e., fishing) not anticipated to occur within the wetlands areas.
		Sediment	Sediment	Sediment	Recreational Fisherman	Adult/ Child	Ig D	None	Recreational activities (i.e., fishing) not anticipated to occur within the wetlands areas.
				Sediment	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	Trespasser may access wetlands areas via Site.
				Sediment	Pipeline Worker	Adult	Ig D	None	No current pipeline work within this area.
Southern Property – Wetlands Area (Exposure Area 6)	Future	Surface Water	Surface Water	Surface water	Recreational Fisherman	Adult/ Child	Ig D	None	Recreational activities (i.e., fishing) not anticipated to occur within the wetlands areas.
				Surface water	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	Trespasser may access wetlands areas via Site.
				Surface water	Pipeline Worker	Adult	Ig D	Quantitative	Future pipeline work may occur within this area
				Biota	Recreational Fisherman	Adult/ Child	Ig	None	Recreational activities (i.e., fishing) not anticipated to occur within the wetlands areas.
		Sediment	Sediment	Sediment	Recreational Fisherman	Adult/ Child	Ig D	None	Recreational activities (i.e., fishing) not anticipated to occur within the wetlands areas.
				Sediment	Trespasser	Adolescent (6 to 16 years)	Ig D	Quantitative	Trespasser may access wetlands areas via Site.
				Sediment	Pipeline Worker	Adult	Ig D	Quantitative	Future pipeline work may occur within this area

Notes:
a/ D = dermal; Ig = ingestion

Table 1-7
Selection of Exposure Pathways - Site-Wide Groundwater (Exposure Area 7)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Site-Wide Shallow Groundwater	Current	Groundwater	Groundwater	Groundwater	All	All	Ig D Iv	None	The are no current operations at the Site. There are no potable wells on the Site.
			Air	Ambient Outdoor	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities.
			Air	Ambient Outdoor	Maintenance Worker	Adult	Iv	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Air	Ambient Outdoor	Recreational Fisherman	Adult/ Child	Iv	None	Recreational Fishermans anticipated to spend the majority of the time in surface water bodies. Therefore, there would be limited exposure to volatile COPCs migrating from the subsurface.
			Air	Indoor Air	All	All	Iv	None	There are no current operations at the Site. Access to buildings is restricted.
		LNAPL	LNAPL	LNAPL	All	All	Ig D Iv	None	The are no current operations at the Site. There are no potable wells on the Site.
			Air	Ambient Outdoor	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities.
			Air	Ambient Outdoor	Maintenance Worker	Adult	Iv	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.
			Air	Ambient Outdoor	Recreational Fisherman	Adult/ Child	Iv	None	Recreational Fishermans anticipated to spend the majority of the time in surface water bodies. Therefore, there would be limited exposure to volatile COPCs migrating from the subsurface.
			Air	Indoor Air	All	All	Iv	None	There are no current operations at the Site. Access to buildings is restricted.
Site-Wide Shallow Groundwater	Future	Groundwater	Groundwater	Tapwater	All receptors	All	Ig D Iv	None	There are no shallow sand water bearing zones within the Prairie Terrace Confining Unit and the yield from silts and clay is too low to support potable use.
			Groundwater	Groundwater	Pipeline Worker	Adult	Ig D Iv	Quantitative	There is the potential for future subsurface work on the underground pipeline. This work may extend into the water table.
			Groundwater	Groundwater	Commercial/Industrial Worker	Adult	Ig D Iv	None	There are no shallow sand water bearing zones within the Prairie Terrace Confining Unit and the yield from silts and clay is too low to support potable use.
			Groundwater	Groundwater	Construction Worker	Adult	Ig D Iv	Quantitative	There is the potential for future subsurface construction work. This work may extend into the water table.
			Groundwater	Groundwater	Resident	Adult/Child	Ig D Iv	None	There are no plans for residential development of the Site. There are no shallow sand water bearing zones within the Prairie Terrace Confining Unit and the yield from silts and clay is too low to support potable use.
			Air	Ambient Outdoor Air	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities.
			Air	Ambient Outdoor Air	Maintenance Worker	Adult	Iv	Quantitative	Maintenance worker potentially exposed during maintenance of landscape and operational areas at the Site.
Site-Wide Shallow Groundwater	Future	Groundwater	Air	Ambient Outdoor Air	Pipeline Worker	Adult	Iv	Quantitative	There is the potential for future work on the underground pipeline. This work may extend into the water table.
			Air	Ambient Outdoor Air	Commercial/Industrial Worker	All	Iv	None	There are no shallow sand water bearing zones within the Prairie Terrace Confining Unit and the yield from silts and clay is too low to support potable use.

Table 1-7
Selection of Exposure Pathways - Site-Wide Groundwater (Exposure Area 7)
SBA Shipyard Superfund Site
Jennings, Louisiana

Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
		LNAPL	Air	Ambient Outdoor Air	Construction Worker	Adult	Iv	None	There is the potential for future work on the underground pipeline. This work may extend into the water table.
			Air	Ambient Outdoor Air	Resident	Adult/Child	IV	None	There are no plans for residential development of the Site.
			Air	Ambient Outdoor Air	Recreational Fisherman	Adult/Child	Iv	None	Recreational Fishermans anticipated to spend the majority of the time in surface water bodies. Therefore, there would be limited exposure to volatile COPCs migrating from the subsurface.
			Air	Indoor Air	Trespasser	Adolescent (6 to 16 years)	Iv	None	Access to buildings will be restricted. Trespasser anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Maintenance Worker	Adult	Iv	None	Access to buildings will be restricted. Maintenance worker anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Pipeline Worker	Adult	Iv	None	Access to buildings will be restricted. Pipeline worker anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Commercial/Industrial Worker	All	Iv	Quantitative	There is the potential for future commercial/industrial development of property.
			Air	Indoor Air	Construction Worker	Adult	Iv	None	Access to buildings will be restricted. Construction worker anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Resident	Adult/Child	Iv	None	There are no plans for residential development of the Site.
			Air	Indoor Air	Recreational Fisherman	Adult/Child	Iv	None	Recreational Fishermans anticipated to spend the majority of the time in surface water bodies. Therefore, there would be limited exposure to volatile COPCs migrating from the subsurface.
			LNAPL	LNAPL	Pipeline Worker	Adult	Ig D Iv	Quantitative	There is the potential for future subsurface work on the underground pipeline. This work may extend into the water table.
			LNAPL	LNAPL	Commercial/Industrial Worker	Adult	Ig D Iv	None	There are no shallow sand water bearing zones within the Prairie Terrace Confining Unit and the yield from silts and clay is too low to support potable use.
			LNAPL	LNAPL	Construction Worker	Adult	Ig D Iv	Quantitative	There is the potential for future subsurface construction work. This work may extend into the water table.
			LNAPL	LNAPL	Resident	Adult/Child	Ig D Iv	None	There are no plans for residential development of the Site. There are no shallow sand water bearing zones within the Prairie Terrace Confining Unit and the yield from silts and clay is too low to support potable use.
			Air	Ambient Outdoor	Trespasser	Adolescent (6 to 16 years)	Iv	Quantitative	Trespasser exposed during unauthorized activities.
			Air	Ambient Outdoor	Maintenance Worker	Adult	Iv	Quantitative	Maintenance of landscape and operational areas occurs currently at the site.

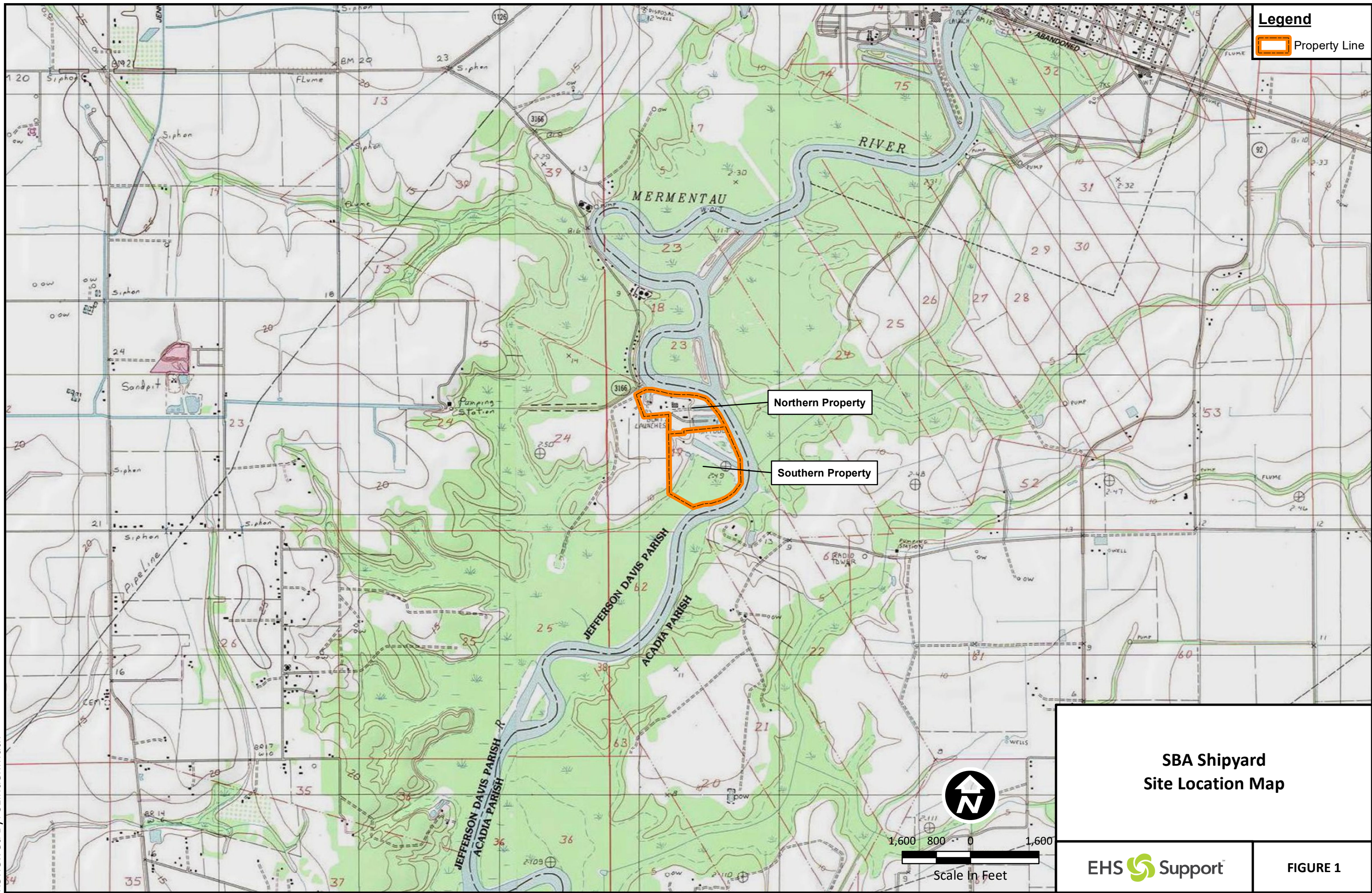
Table 1-7
Selection of Exposure Pathways - Site-Wide Groundwater (Exposure Area 7)
SBA Shipyard Superfund Site
Jennings, Louisiana

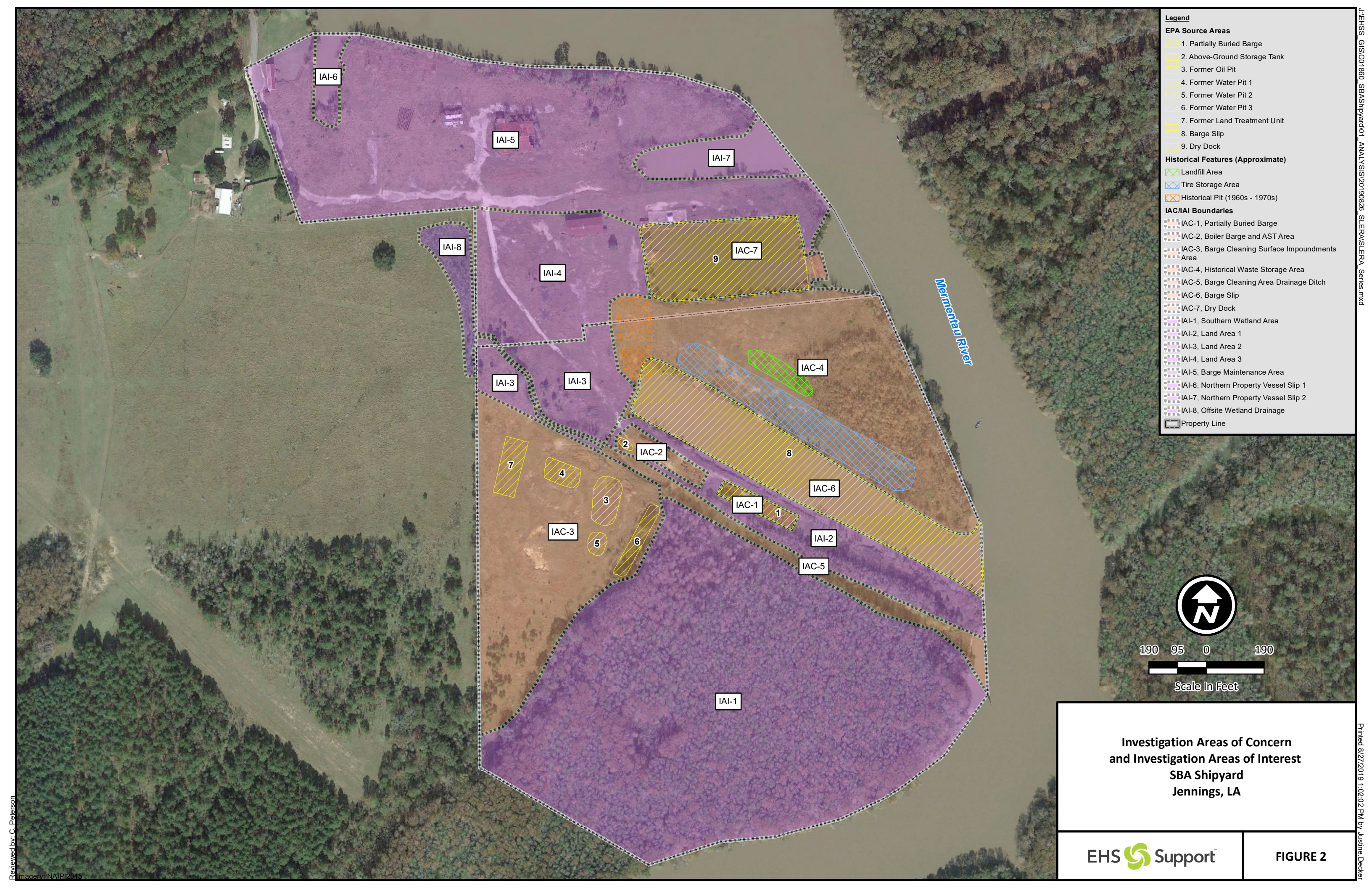
Exposure Area	Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Site-Wide Shallow Groundwater	Future	LNAPL	Air	Ambient Outdoor	Recreational Fisherman	Adult/Child	Iv	None	Recreational Fishermans anticipated to spend the majority of the time in surface water bodies. Therefore, there would be limited exposure to volatile COPCs migrating from the subsurface.
			Air	Indoor Air	Trespasser	Adolescent (6 to 16 years)	Iv	None	Access to buildings will be restricted. Trespasser anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Maintenance Worker	Adult	Iv	None	Access to buildings will be restricted. Maintenance worker anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Pipeline Worker	Adult	Iv	None	Access to buildings will be restricted. Pipeline worker anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Commercial/Industrial Worker	All	Iv	Quantitative	There is the potential for future commercial/industrial development of property.
			Air	Indoor Air	Construction Worker	Adult	Iv	None	Access to buildings will be restricted. Construction worker anticipated to spend majority of time on Site outside.
			Air	Indoor Air	Resident	Adult/Child	Iv	None	There are no plans for residential development of the Site.
			Air	Indoor Air	Recreational Fisherman	Adult/Child	Iv	None	Recreational Fishermans anticipated to spend the majority of the time in surface water bodies. Therefore, there would be limited exposure to volatile COPCs migrating from the subsurface.

Notes:
1. Iv = inhalation of volatiles; D = dermal; Ig = ingestion
COPC = constituent of potential concern
LNAPL = light non-aqueous phase liquid



Figures





Legend

EPA Source Areas

- 1. Partially Buried Barge
- 2. Above-Ground Storage Tank
- 3. Former Oil Pit
- 4. Former Water Pit 1
- 5. Former Water Pit 2
- 6. Former Water Pit 3
- 7. Former Land Treatment Unit
- 8. Barge Slip
- 9. Dry Dock

Historical Features (Approximate)

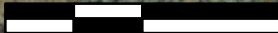
- Landfill Area
- Tire Storage Area
- Historical Pit (1960s - 1970s)

IAC/IAI Boundaries

- IAC-1, Partially Buried Barge
- IAC-2, Boiler Barge and AST Area
- IAC-3, Barge Cleaning Surface Impoundments Area
- IAC-4, Historical Waste Storage Area
- IAC-5, Barge Cleaning Area Drainage Ditch
- IAC-6, Barge Slip
- IAC-7, Dry Dock
- IAI-1, Southern Wetland Area
- IAI-2, Land Area 1
- IAI-3, Land Area 2
- IAI-4, Land Area 3
- IAI-5, Barge Maintenance Area
- IAI-6, Northern Property Vessel Slip 1
- IAI-7, Northern Property Vessel Slip 2
- IAI-8, Offsite Wetland Drainage
- Property Line



190 95 0 190



Scale In Feet

Investigation Areas of Concern
and Investigation Areas of Interest
SBA Shipyard
Jennings, LA

Figure 3 Conceptual Site Exposure Model - Soil

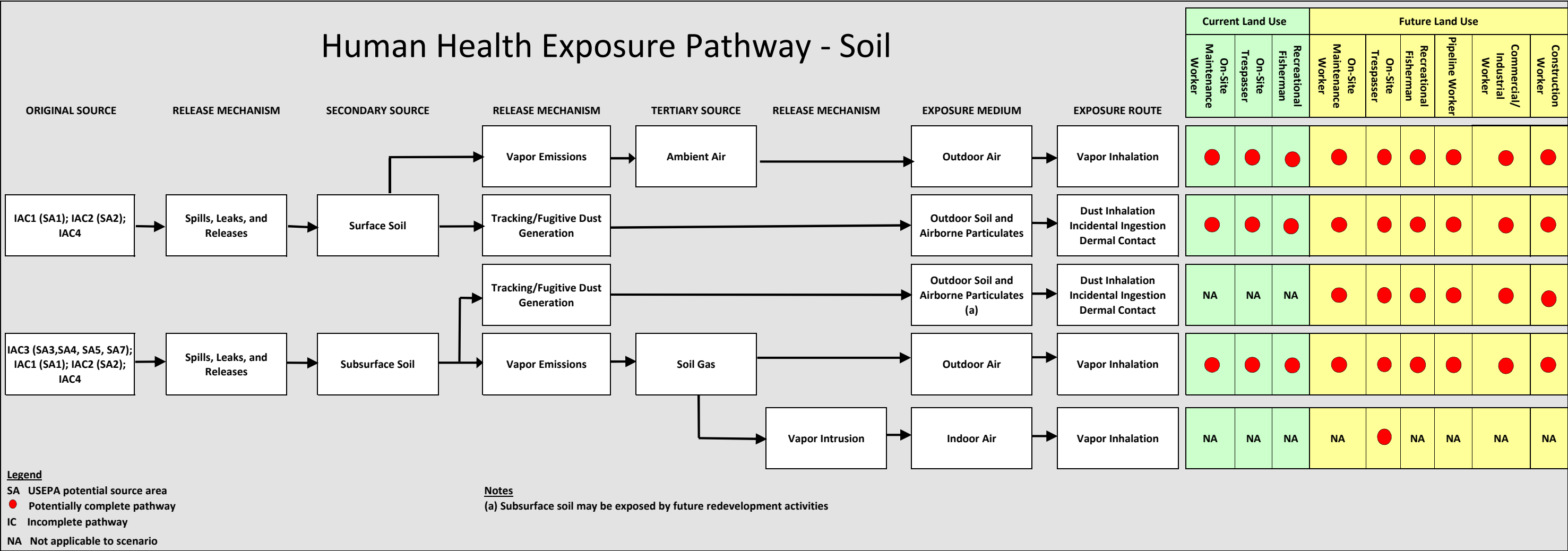
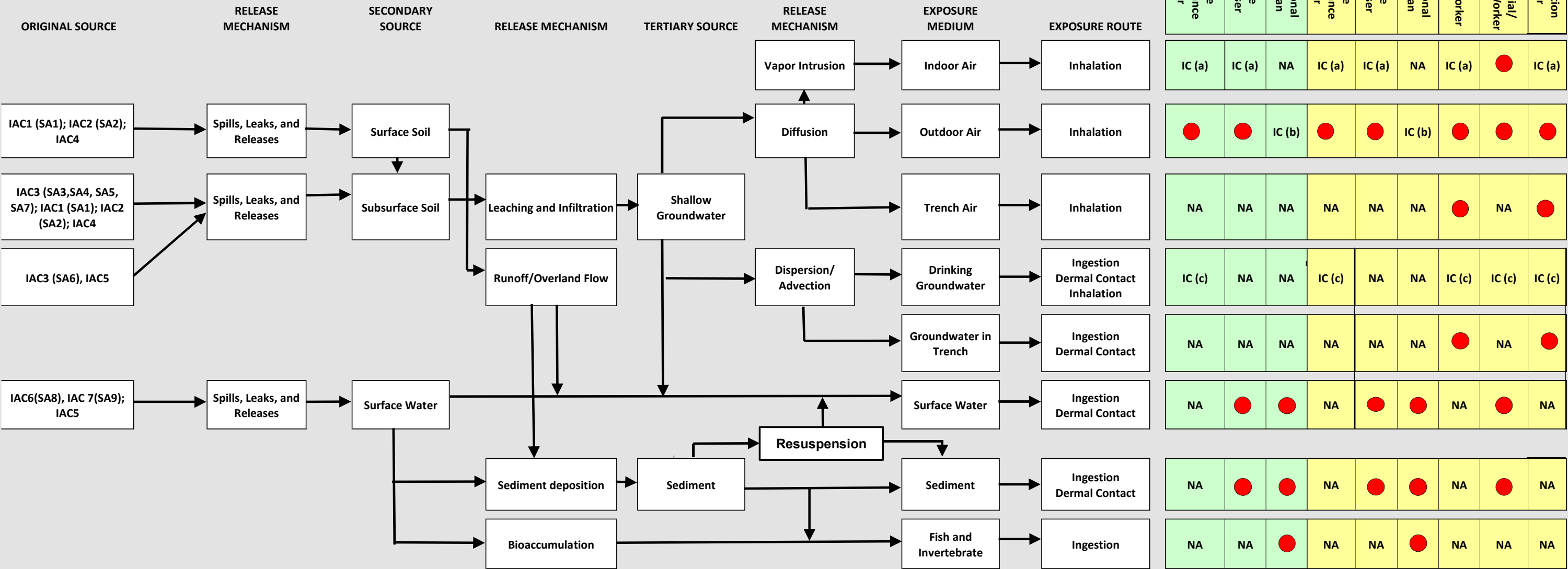


Figure 4

Human Health Exposure Pathway - Groundwater and Surface Water



Legend
SA USEPA potential source area
● Potentially complete pathway
IC Incomplete pathway
NA Not applicable to scenario

Notes
(a) Maintenance Worker, Pipeline Worker, Construction Worker, Trespasser anticipated to spend majority of time outside.
(b) Recreational fisherman anticipated to spend majority of time on surface water bodies. Surface water will act as barrier to vapor migration from groundwater.
(c) There is no current potable use of groundwater; drinking water supplied by town of Mermentau.

Legend

Underground Pipeline

EPA Source Areas

1. Partially Buried Barge

2. Above-Ground Storage

3. Former Oil Pit

4. Former Water Pit 1

5. Former Water Pit 2

6. Former Water Pit 3

7. Former Land Treatment Unit

8. Barge Slip

9. Dry Dock

Historical Features (Approximate)

Landfill Area

Tire Storage Area

Historical Pit (1960s - 1970s)

IAC/IAI Boundary

Property Line

Exposure Areas

Northern Property – Dry Dock

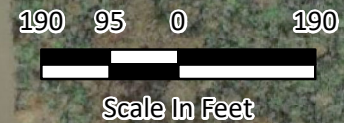
Northern Property - Operational

Northern Property - Slips

Southern Property - Operational

Southern Property - Barge Slip

Southern Property - Wetland



**Human Health
Exposure Areas
SBA Shipyard
Jennings, LA**